U.S. Department of Energy Office of Independent Oversight Criteria Review and Approach Document	Subject: Environmental Radiation Protection, Inspection Criteria, Approach, and Lines of Inquiry Director, Office of ES&H Evaluations Date: 12/7/09 Criteria Lead, ES&H Evaluations Date: 12/7/2009	HS: HSS CRAD 64-36 Rev: 0 Eff. Date: December 7, 2009 Page 1 of 7

1.0 PURPOSE

Within the Office of Independent Oversight, the Office of Environment, Safety and Health (ES&H) Evaluations' mission is to assess the effectiveness of those environment, safety and health systems and practices used by field organizations in implementing Integrated Safety Management (ISM) and to provide clear, concise, and independent evaluations of performance in protecting our workers, the public, and the environment from the hazards associated with Department of Energy (DOE) activities and sites. A key to success is the rigor and comprehensiveness of our process; and as with any process, we continually strive to improve and provide additional value and insight to field operations. Integral to this is our commitment to enhance our program. Therefore, we have revised our Inspection Criteria, Approach, and Lines of Inquiry for internal use and also we are making them available for use by DOE line and contractor assessment personnel in developing and implementing effective DOE oversight and contractor self-assessment and corrective action processes.

2.0 APPLICABILITY

The following Inspection Criteria document is approved for use by the Office of ES&H Evaluations.

3.0 FEEDBACK

Comments and suggestions for improvements on these Inspection Criteria, Approach, and Lines of Inquiry can be directed to the Director of the Office of ES&H Evaluations at (301) 903-5392.

Environmental Radiation Protection
Inspection Criteria, Approach, and Lines of Inquiry

The following provides an overview of the typical activities that will be performed to collect information to evaluate environmental radiation protection programs, processes, practices, and implementation of integrated safety management. The following Inspection Activities apply to all Inspection Criteria listed below:

Inspection Activities: Review environmental radiation management and control processes and implementing procedures. Interview personnel, including environmental radiation protection supervisors, staff, and subject matter experts. Review project policies, procedures, and corresponding documentation related to ISM core function and Nuclear Safety implementation.

Inspection Activities: Perform facility/building walk-downs and inspections; observe selected work activities and performance of activities, such as radiation dose evaluations, environmental radiological protection and facility design, radiological environmental monitoring, unplanned releases of radioactive material, radiological contamination control and environmental as low as reasonably achievable (ALARA) implementation.

Radiation Dose Evaluations

Inspection Criteria: A program is in place for demonstrating compliance with limits for radiation exposure to the public and the environment (i.e., biota) by documenting an appropriate combination of measurements and calculations.

Inspection Lines of Inquiry:

- Has a system been established for evaluating the dose to the public and environment considering realistic exposure modes and pathways from routine DOE activities, including remedial actions?
- Has a system been established to ensure preparation and issuance of an annual site environmental report (ASER) that provides documentation to the general public on the results of environmental monitoring and surveillance for radionuclides and estimates potential doses to a member of the public?
- Has a system been established to protect native aquatic organisms and the assessment of potential dose to native aquatic organisms as part of the environmental radiation protection program?
- Has a system been established to ensure that necessary reporting requirements are identified and performed?
- Is a system in place to ensure that dose evaluations are supported with updated and accurate information, which includes the documented justification of all parametric values used?
- Are source-term estimates for both liquid and airborne releases obtained from calculations and/or data from effluent monitoring programs?

- Is transport modeling used to predict atmospheric, surface water, and groundwater behavior and movement of releases?
- Is environmental pathway analysis modeling performed to account for bioaccumulation in food products and the annual usage assessed?
- Has the need for particle-size analysis or lung solubility classes of emissions been evaluated based on projected dose equivalent from particulate inhalation?
- Are published dose rate factors used to compute annual doses resulting from radionuclide releases? Acceptable dose-rate factors include the Environmental Protection Agency (EPA) Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion (EPA-520/l-88-020) and those in the DOE documents entitled Internal Dose Conversion Factors for Calculation of Dose to the Public (DOE/EH-0071) and External Dose-Rate Conversion Factors for Calculation of Dose to the Public (DOE/EH-0070).
- Is a system in place for selecting and validating appropriate models for evaluating the dose to the public?
- Is information used to calculate the dose to the public, including the extent and use of affected air, land, and water, as well as specific local or public interests or concerns, and is this information identified, documented, used as a part of the program basis, and periodically re-evaluated?
- Are "background" or "control" location measurements made for every significant radionuclide and pathway combination that is considered in the dose calculations?

Environmental Radiological Protection and Facility Design

Inspection Criteria: A system is in place for ensuring that environmental radiological protection is considered in the design, construction, use, and modification of facilities in which radioactive materials are or will be handled.

Inspection Lines of Inquiry:

- Is a formal program in place to ensure that the general design criteria and other requirements applicable to environmental radiation protection are identified and incorporated into new facilities or facility modifications during the earliest phases of the project life cycle?
- Is a formal program in place to ensure that all existing and new radiological activities and nuclear facilities are evaluated for potential radiological impacts to the environment and the public during the earliest phases of the life cycle to determine if a safety analysis is required?
- Is a formal system in place to evaluate all changes to radiological activities and nuclear facilities to ensure that such changes do not constitute a significant modification with respect to the potential radiological impacts to the environment or the public, and to identify the need to develop or modify a safety analysis plan?
- Is a process to identify features and procedures that facilitate decommissioning during the facility planning and design phase established, and is their identification based on a decommissioning proposal that envisions conversion of the facility to other use?
- Has a formal process been established whereby facility designs, operational activities, and safety analyses undergo independent review and approval by individuals with expertise in applicable areas of environmental radiation protection?

- Is a process in place to evaluate the radiological impacts to the environment from DOE activities and facilities that includes a level of effort commensurate with the types and magnitude of the environmental hazards involved?
- Has a program been established to review all operational changes, new facilities, and facility modifications to determine if they will increase discharges of radioactively contaminated liquids to soil columns, create new soil column discharge areas, or discharge uncontaminated liquid to an inactive soil column release area?

Radiological Environmental Monitoring Program

Inspection Criteria: A program is in place for monitoring and quantifying the radiological emissions into the environment attributable to DOE facility operations and activities.

Inspection Lines of Inquiry:

- Has an evaluation been conducted of the potential for radiological emissions and of exposure pathways for all potential radionuclides which forms the bases for radiological effluent monitoring and environmental surveillance programs?
- Is a program in place to conduct a preoperational assessment of all facilities coming on-line (new or modified) to determine the types and quantities of effluents to be expected?
- Are radiological effluent monitoring and environmental surveillance programs in place that include a periodic reevaluation to identify whether the rationale for existing program designs has changed? When changes to program designs are justified, is the basis for the changes documented, reviewed, and approved?
- Are programs in place to ensure that the overall accuracy and precision of radiological effluent monitoring and environmental surveillance data are calculated, the approximate Environmental Detection Limit is calculated to a specified confidence level, and the calculations are documented to demonstrate the statistical validity of the results?
- Are programs in place to ensure that representative samples are obtained and that all factors germane to proper sample collection are identified and incorporated into sampling activities?
  1. Has exposure pathway analysis been conducted for each site radionuclide effluent or emission?
  2. Are documented site-specific criteria used for selection of samples, measurements, instruments, equipment, and sampling or measurement locations?
  3. Does surveillance include the range of applicable onsite media resources; i.e. air, surface water, groundwater, storm water, soil, sediment, flora and fauna, and are sampling locations sufficient to detect impacts and trends?
  4. Does program design and environmental surveillance conducted provide data sufficient to characterize doses to biota?
  5. Are expected releases based on operating controls on liquid effluents and airborne emissions compared to actual releases; and if not, are environmental surveillance needs re-evaluated appropriately?
  6. Where environmental surveillance data is used with (or in place of) effluent monitoring/modeling to demonstrate 40 CFR Part 61, have these regulatory requirements been considered?

- For continuous monitoring systems required, have alarms been set to provide timely warnings? Are the systems designed to signal the need for corrective actions to prevent public or environmental exposures from exceeding recommended limits?

Unplanned Releases of Radioactive Material

Inspection Criteria: A program is in place for evaluating unplanned releases of radioactive materials and assessing the impact of such releases on members of the public and on the environment.

Inspection Lines of Inquiry:

- Are formal emergency plans and procedures established that provide for the assessment of onsite and offsite consequences of the unplanned release of radioactive material?
- Are plans and procedures in place that describe environmental radiological sampling of applicable media and direct measurements of radioactivity in the environment?
  1. Do emergency response plans specify emergency environmental monitoring systems and procedures?
  2. Are appropriate provisions made for detection and quantification of unplanned releases of radionuclides to the environment, including radionuclides that may be transported by storm water runoff, flooding, or resuspension of ground-deposited material?
- Are the roles of each member of the field and consequence analysis teams formally defined? Do the members receive initial classroom training, periodic retraining, and participate in exercises specific to their assigned responsibilities?
- Are dedicated facilities, equipment, and supplies identified, listed in procedures, and maintained (through inventory, calibration, or maintenance) as appropriate? For facilities, equipment, and supplies that cannot be dedicated, is a formal mechanism in place for ensuring that the amounts and types identified in the procedures are always available?
- Does the consequence analysis team have ready access to real-time and historical effluent monitoring data, meteorological information, safety analyses, hazard information, radioactive materials inventory, and related information for each building?
- Does the consequence analysis team have a documented method of calculation for performing offsite dose projections, initial assessments, extended assessments, and post-accident assessments, as well as, a method for determining source terms from field data?
- Does the consequence analysis team have formal methods and procedures for evaluating and recommending protective actions for the public and the environment?
- Has a process been established for ensuring accurate and timely reporting of unplanned releases?

Radiological Contamination Control

Inspection Criteria: A program has been established for ensuring the protection of the public and the environment from the spread of radiological contamination.

Inspection Lines of Inquiry:

- Has a process been established for identifying and quantifying residual radioactive contamination of real property?
- Has a system for controlling the use and disposal of radioactively contaminated items and equipment been established?
- Is documentation of the disposition of radioactively contaminated items and equipment maintained?
- Is the disposition of radioactively contaminated items and equipment subject to the ALARA policy and is the application of the ALARA policy documented?
- Are appropriate provisions made for detection, quantification, and control of the migration of radiological contamination to the environment, including radionuclides that may be transported from contaminated areas by storm water runoff, flooding, or resuspension of ground-deposited material?
- Has a program been established for identifying past and current discharges of radioactively contaminated liquids to soil columns that includes plans for preventing future discharges, phasing out current releases, and controlling access and all discharges to inactive soil column discharge areas?
- Are contaminated soil columns, drainage systems, and groundwater to which radiologically contaminated liquid discharges have been discontinued been identified, and are these being managed or decontaminated pursuant to appropriate requirements?

Environmental ALARA Program

Inspection Criteria: A program is in place for maintaining radiation exposures of the public and environment to levels below the appropriate dose limits and ALARA.

Inspection Lines of Inquiry:

- Is a documented ALARA program in place that addresses the factors and issues defined in DOE's ALARA guidance document; i.e., goals of reducing, minimizing, or eliminating releases of radiological effluents are established annually; and progress is evaluated by tracking of results of effluent monitoring?
- Is the ALARA process implemented through a set of controlled documents such as implementing procedures and work instructions?
- Is the ALARA process applied to all activities that might result in radiation doses to the public or the environment?
    1. Are environmental monitoring surveillance and health physics data reviewed regularly and appropriate actions taken in response to abnormal, unusual, or unexpected results? Are action levels documented?
    2. Are environmental monitoring surveillance and health physics data reviewed regularly to determine if modifications or improvements to the overall design (i.e., sampling methods, location, analysis, etc.) are needed to meet data quality objectives or overall program performance?
    3. Are administrative controls, engineering controls, safety structures, systems, and components sufficient to maintain radiological effluents ALARA?
    4. Do planning and radiological work documents include consideration of environmental radiological hazards, mitigation, and appropriate monitoring?

5. Are project Environmental ALARA goals established and is progress tracked commensurate with potential environmental impact or public exposure?
6. Are contaminated soil columns, drainage systems, and groundwater to which radiologically contaminated liquid discharges have been discontinued been identified, and are being managed or decontaminated pursuant to appropriate requirements?
7. Has a process been established to demonstrate that best available technology (BAT) and ALARA processes are applied to any soil column releases (appropriately approved by exception) of process-derived radionuclides?
8. Is the disposition of radioactively contaminated items and equipment subject to a documented ALARA policy?

- Is the effort expended in gathering information to support the ALARA process commensurate with the magnitude of potential doses and costs?
- Does the process for ALARA decisions involve the consideration of appropriate options and their potential performance, and are these decisions based on appropriate quantitative and qualitative methods? Are judgmental criteria explicitly defined and documented, and is an effective audit trail created?
- Is information gained through routine radiological monitoring or surveillance programs used to support the ALARA process and evaluate its effectiveness?
  1. Are environmental monitoring, surveillance, and health physics data reviewed and appropriate actions taken in response to impact on proposed ALARA goals?
  2. Is radiological data collected from surveillance and effluent monitoring compared to any initial project environmental ALARA reviews?
  3. Is tracking and trending of radiological effluent monitoring and surveillance data used to review ALARA goals for the benefit of lowering environmental administrative control limits?